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INNOVATION IN SERVICES: THE CONTRIBUTIONS OF DESIGN THEORY

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ABSTRACT

Research in economics clearly points out that our economy is increasingly dependent on services but, paradoxically, the literature on innovation remains oriented toward product. Therefore many firms lack well-tested methods to develop new services and rely on informal and largely haphazard processes. The paper makes use of the recent advances in design theory to propose an integrated model of New Service Development. It illustrates how the identification of six design parameters of a new service (target clientele, support product, contract, front & back-office processes, economic model) helps clarifying the working of NSD processes. Further the paper assigns four different uses of the model as a NSD management tool.

INTRODUCTION¹

Management researchers and practitioners are currently confronted with a paradox. While much research very clearly shows that our economies are increasingly dependent on tertiary activities [1], the substantial amount of literature that has developed around the question of the structure of the design process deals for the most part with development and innovation in the area of tangible goods [2]. As Thomke [3] points out, this focus on the question of product innovation probably explains the relative dearth of confirmed methods for the development of new services. The existing studies on innovation in services are in agreement on the following point: the innovation and design process is still largely unformulated in service companies, which partially explains the problems (i.e. the inability to meet deadlines, unsatisfactory quality, etc.) frequently observed during the development of new services [4-6].

This situation is problematic in a context in which competition through innovation is spreading to all sectors and in which the massive deployment of Information and Communication Technologies (ICTs) has a profound impact on service activities [7-9]. This is all the more true given that innovation in services is not limited to “pure” service companies (i.e. banks, insurance, transportation, business-to-business services, etc.). Manufacturing companies are also associating more and more services with their products in order to differentiate their product ranges by offering their customers solutions better adapted to their needs [10].

¹ This article draws on several research reports co-written with C. Midler who made a significant contribution to the formulation of the ideas and concepts that we will develop here. We would like to express our friendship and gratitude to him for his contributions.

The question of management methods adapted to innovation in services thus constitutes both a practical and a theoretical problem. It opens up a new field of investigation for researchers working on the question of the organisation of the design and/or management of services. This article approaches this question with the help of interactive research [11-12] currently underway at a large European automobile manufacturer, referred to in this paper as Telcar.

The automotive industry is a good example of an industry offering a product-service combination [13]. Although historically in this sector, the product-service pair has been dominated by the product, manufacturers are offering their customers a full range of services aimed at facilitating the purchase of the vehicle (i.e. credit), its upkeep (i.e. maintenance), its availability (i.e. assistance in the event of a breakdown) or a package of all three (i.e. a monthly lease including these different services). This tendency to develop services related to the vehicle has recently been strengthened:

1. by creating service packages that until recently were offered independently². The goal here is to get the customer to accept a monthly lease payment for the vehicle;
2. by using ICTs to offer customers new types of “telematics services” (address transmission, navigational aids, remote maintenance, emergency and breakdown calls, etc.). This opening up of potential areas of development as regards service constitutes an important innovation for manufacturers who are venturing into a field of which they do not yet have a full understanding.

It is this second trend that we have had the opportunity to study at Telcar by participating in the design process for new services “in real time”. In a preceding article [14], we presented the challenges related to the development of telematics services and the organizational solution adopted by Telcar. At that time, we analysed the interest of deploying a cross-disciplinary platform dedicated to the exploration of this field of innovation.

In this paper, we would like to continue the analysis of the new service design process by focusing on the unfolding of the process and the means of managing it, rather than on the organisation of the project. After briefly introducing the problem of innovative service design, we will analyze the contributions of the literature on services. This will lead us to propose a model of the design process for a service based on recent trends in design theory. Using the emergency call service proposed by Telcar as an example, we will then show the various possible applications of the proposed model and its interest for designers.

DESIGNING INNOVATIVE SERVICES: A REVIEW OF THE LITERATURE

Innovation in services encounters the generic problems characteristic of any innovation process, which can be roughly broken down into two categories [15]:

1. The generation of innovative ideas and new concepts, i.e. the invention stage, strictly speaking.
2. The management of the innovation project. In other words, once the invention stage has been “completed”, the challenge is to market a product/service using this invention. This implies both coordinating the design process, which refers back to the management of innovative projects [16], and establishing a favourable environment for innovation [17].

² Plans combining assistance, financing and maintenance included in a monthly lease payment are becoming increasingly common (Tooty on the A-Class, Smart Box, Smart Moove, etc.).

The contributions of the literature on the development of new services on these two questions are very different.

Generating concepts for new services

The first point is infrequently dealt with in the literature on services. The studies on the question generally rely on methods developed for the generation of product concepts (for a review of these methods see [18]) by insisting, in view of the specific characteristics of the service, on the importance of observation of the customer and of the involvement of customer contact personnel. Edvardsson et al. [19] thus show the interest of ethnographic methods for understanding the needs of users (in the broadest sense of “customer” and “customer contact personnel”).

This question of the generation of concepts is relevant to the example of telematics services. This is, in fact, a typical example of a field conducive to innovative design, i.e. a field in which neither utilization values, nor the areas of competence required are defined [20]. The difficulty is therefore to simultaneously explore these two dimensions. Our involvement in the telematics project offered us the opportunity to observe two different approaches for exploring the field, conducted by multidisciplinary groups (i.e. marketing, information systems, advanced studies, etc.):

- The first is based on the technical possibilities offered by ICTs for the development of new services and/or the enrichment of existing services.
- The opposite approach involves investigating the requests of customers to define the services and technical features of onboard equipment.

In practice, the two approaches are complementary. The first defines the full range of options in light of the technical possibilities of the available equipment, while the second focuses on devising a package of services that will appeal to customers. The exercise is especially delicate, however, inasmuch as the market, by definition, does not yet exist. Customers cannot therefore be requesters of telematics services. Moreover, these approaches are always partial and limited by more or less pressing operational objectives. They are unlikely to provide a broad view of the field of telematics services or to suggest which areas of innovation should be explored. This lack of methods for exploring innovation in services is a problem for those involved. It is this vacuum that we are endeavouring to fill with this article.

Managing the innovation process

On the question of the process itself, the literature on innovation management in the service sector offers a number of contributions on the process itself, its content and the difficulties encountered.

One research project has investigated the design process for services by drawing widely from studies of the development of new products [21]. These studies, which are usually prescriptive in nature, offer a general view of the design process for a service by distinguishing the broad stages of the process (see, for instance, the frequently quoted overview provided by Scheuing and Johnson [22]). The models vary depending on the number of stages involved, but draw freely on the major stages of any design process (i.e. generation of ideas, selection, development and testing of the concept, industrialization, marketing). This is both their strength and weakness. In fact, even though the framework supplied is relatively widely accepted, the models are generally rather poor concerning content, the exact operation of the process and the

specific management problems of the various stages³. Furthermore, central questions such as the organizational structure required to manage the process or the relationships between the various stages (sequential or concurrent) are rarely dealt with.

Studies on service production systems, however, can shed some light on the content of the design process. In fact, they provide a description of the constituent elements of the service and, as a result, on those elements that need to be developed. The work of Eiglier and Langeard on “Servuction” [13] is particularly useful in this context. They distinguish six elements in a servuction system:

- i. The customer;
- ii. The physical support structure (i.e. all of the equipment required for the delivery of the service by specifying the instruments required for the customer and/or the contact personnel, and the environment);
- iii. Contact personnel;
- iv. The service, defined as the “*result of the interaction between customers, the physical support structure and contact personnel*”;
- v. The internal system of organisation responsible for the operation of the servuction system;
- vi. Other customers included in the system.

They then specify that the concept for the service, the target customer segment and the servuction system must be considered simultaneously during the process of service innovation. Their work makes it possible to clarify what is meant by service design, which, in addition to the innovative concept, must deal with the question of the type of servuction system to be deployed. In the same spirit, Shostack [23-24] has proposed a tool, with his “blueprints”, for representing the servuction system by distinguishing the front and back-office. The objective is to diagram the operation of the service on paper prior to its implementation, in order to anticipate any problems and specify performance and quality criteria. This contribution is interesting because, as Bancel and Jougleux [25] have pointed out, the servuction model considers the back-office process to be a “black box”. But, as we will see, its implementation raises some formidable design problems when it is based on innovative techniques such as those provided by ICTs.

Finally, a third set of studies is focussed on the difficulties observed in the functioning of the design process. There are two distinct schools of thought in this regard:

- The first focuses on a particular aspect of the service design process. The central question concerns the impact of the intangibility of the service and of its co-production by the customer. Under these conditions, how does one test the service and ensure that it is performed satisfactorily? The tricky question of the inclusion of the customer in the design process [19, 26] and the question of experimentation when no tangible goods are produced, [3, 27] have thus been developed in a particularly interesting way.
- A second school of thought uses case studies of innovation, dealing for the most part with “pure” services (i.e. banks, insurance companies, hotels, business consulting services, etc.), to reveal the difficulties encountered by service companies during the design process [13, 4, 5, 6]. Their conclusions are remarkably convergent. They cite a lack of structure in the

³ The “concept development” stage, present in almost all models, is not analysed in detail: what is a concept in the case of a service? How do we generate them? Who has the required skills? What aspects of the service should be explored at this time? etc.

process (which underlines the normative nature of the models mentioned above), the infrequency of testing, the emphasis placed on technical problems to the detriment of customer involvement, the difficulty in mobilizing contact personnel and so on – all of which we observed on the Telcar project [14].

As we have seen, the literature on the development of new services sheds some light on the various dimensions of the new service design process. However, from the point of view of the designer, this heterogeneity is a problem. The studies presented are in fact either too general to be actually put into practice, or too focussed on a particular dimension of the process, or limited to a particular department (generally Marketing, or more rarely Production⁴). The project team in charge of innovation therefore runs the risk of not having an integrating framework that would allow it to conceive of the process as a whole and include these contributions in the strategic management of the process.

DESIGN THEORY AND SERVICE INNOVATION

To overcome these difficulties, it is necessary to develop a model of the design process for a new product/service that is general enough to provide an overview of the process, and which at the same time will allow the designer to identify potential areas for innovation. The C-K theory, in our opinion, can serve this very function. After presenting the theory, using automobile services as an example, we will show how it allows us to clarify the question of service design.

The C-K theory and the design tree concept

The question of how to represent the design reasoning process has been looked at in numerous studies since the pioneering work of Simon [28]. We will here draw on the theory developed by A. Hatchuel [29] and A. Hatchuel and B. Weil [30]. For these authors, at the start of any design process, those involved have at their disposal a knowledge base (K), composed of a body of heterogeneous fields of knowledge (objects, rules, facts, etc.). The design process begins from the moment a question appears that cannot be resolved using the knowledge that we have at the moment. Hatchuel and Weil use the word “concept” to describe this trigger element for the design process. It is “1) *an object included in K (otherwise, no progress is possible)*, 2) *that we wish to define in such a way that it has properties not present in K or properties also formulated as concepts (e.g. designing a ‘telephone for teenagers’, a ‘flying boat’, and so on).*” This “*semantic disjunction*” between the universe of concepts and that of specific fields of knowledge represents the possibility of an action that is unrealizable given the knowledge that we have at the moment. The design process consists in the transition from this desired state to the concrete realization of this state. It takes place simultaneously in two different dimensions.

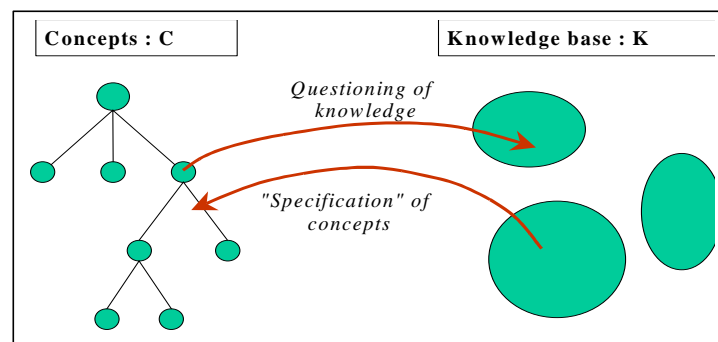
The knowledge bases (K) make it possible to gradually explore the initial concept and to state it. The authors then show that this exploration is achieved by dividing the original concept into sub-concepts, which can be evaluated and, in turn, “subdivided”. The flying boat thus requires wings, or propellers, or both. In this way, a *design tree*, which portrays the genealogy of the design process, is gradually constituted through the generation of alternatives. But, at the same time, the concepts

⁴ The sidestepping of this question by Flipo [6, p. 148] is symptomatic of this “marketing bias” of many studies on innovation in services.

search through the available knowledge bases. They reveal gaps in the knowledge of those exploring them and thus trigger the development of new knowledge.

The design process therefore involves a continuous interaction between the universe of concepts, which take shape gradually, and the universe of the knowledge bases that are being developed (see the diagram below). This involves a transition from a concept (the flying boat) to an object (the hydrofoil). The path is obviously not linear. Certain divisions lead to dead ends, requiring the designer to retrace his steps through a process of “undivision”, resulting in *“a more comprehensive concept allowing him to regenerate the divisions implicit in the concept used”*. This dynamic design tree thus allows one to maintain one's bearings as regards the history of the design inasmuch as it makes it possible to trace the various solutions found back to the original “disjunctive” concept.

Figure 1: The two dimensions of the design process: C and K



Application to the example of automotive services

The theory thus invites us to reason simultaneously in two different dimensions (i.e. concepts and knowledge), which was not the case for earlier theories according to which the two dimensions were not explicitly related to each other.

The conceptual dimension

The question of the concepts at the origin of the design process refers back to the types of services that the company offers or would like to offer its customers. In this regard, an evolution can be observed in the automobile manufacturing business from the production and sales of cars to the production, sales and leasing of cars and related services. A manufacturer such as Telcar thus offers its customers an increasingly complete range of services that can be broken down into five categories:

- Financing: traditional loans, lease with option to buy, etc.
- Maintenance: service as needed or under the form of package deals, etc.
- Emergency assistance: round-the-clock coverage with the loan of a vehicle when necessary or accommodation if the customer is stranded far from home
- Insurance
- Fleet management services.

It should be noted that these categories are not mutually exclusive. Service contracts increasingly combine financing, maintenance and assistance in an all-inclusive package, allowing customers to better manage their automobile budgets. We can thus see an evolution in the concept of the automobile, with the manufacturer increasingly

selling a mobility service, for which the support (in the meaning of [13]) is an automobile.

The knowledge dimension: defining the design variables for a service

Although much has been written on the question of concepts in service innovation [13], much less has been written, or at least not explicitly, on the knowledge that needs to be developed to market the concepts in question. This implies that the variables involved in the design of a service must be determined or, in other words, those elements that must be developed by the project team to fill out the concept. We have isolated six such elements that summarize and complement the contributions of the studies presented previously, and in particular those concerning service production systems [13, 25]. We will examine them now.

i. The target clientele

The customer obviously constitutes the first variable in the design of a service. Eiglier and Langeard [13] thus insist on the importance of precisely defining the customer segment targeted to ensure the success of the innovation (in the case of the automobile, is the service targeted at fleets or individuals? What types of individuals? etc.). But, in more general terms, the literature on service innovation shows both the absolute necessity of including customers in the process, since they are co-producers of the service, and the difficulty of achieving this in actual practice [3, 27]. This explains the low level of attention accorded to the customer in the examples observed [5, 13]. Once a customer segment has been selected, the challenge is then to understand the needs of customers and the uses that they will make of the proposed service concept, and this takes us back to the question of experimentation conducted upstream of the design process [3, 26].

ii. A support product

In their 1987 study, Eiglier and Langeard point out the important role played by the physical support structure in the servuction system. They designate by this term all of the equipment required for the delivery of the service, as well as the service environment, and they emphasize the increasingly important role played by technology in servuction, due to the automation of front-office processes, among other things. The deployment of ICTs has reinforced this trend and, increasingly, the delivery of the service depends on the existence of a product that makes the service possible (e.g. a two-way navigational system in the case of telematics services, a “GPRS or UMTS” compatible mobile phone for the new services proposed by telecom operators, online PDAs, etc.).

Innovation in services therefore increasingly requires the development of innovative support equipment. The problem is then to coordinate two separate design processes that do not necessarily have the same time frames, and which may not necessarily be managed by the same teams.

iii. A contract

The legal dimension of the service is not dealt with in service innovation studies, even though certain authors underline the specific issues pertaining to services in this area. Barcet and Bonamy [31] show that services, as opposed to physical goods, “do not involve the transfer of ownership rights, but the creation of a lien, implying a mutual commitment between the producer of the service and the beneficiary” (p. 200). The problem is then to define the conditions under which this

lien may be exercised. Our experience at Telcar shows that this question is not trivial and raises complex legal problems when the proposed concepts engage the company's liability (emergency services, for instance). It is even conceivable that the arrival of ICTs on the scene raise new legal questions, as has been shown by numerous articles on the difficulties of online payment or the impact of online music sales on artists' royalties, to cite two recent examples. To overlook this dimension can totally block or slow down the design process.

iv. A front-office process

Much has been written about the nature of the service relationship and the problems raised by co-production [1]. For the developer, the difficulty is to design the method(s) of interacting with the customer, which is what we generally understand by the front-office process. This is a complex problem since the front-office concept refers back to a set of very different realities, ranging from the traditional bank teller's window to various processes involving complex interactions via multiple channels (shops, the Internet, call centers, etc.). Thus, in the case of automotive services, it is useful to differentiate between two different processes:

- The process through which the product is marketed
- And the process that ensures the co-production of the service (call centers, for instance).

They can be provided by the same entities, but this is not necessarily the case.

The task of designing the front-office must therefore involve the formulation and testing of the means through which this interaction will take place (will it take place through the salesperson in the dealership or through a call center? etc.)⁵. This is where the importance of the internal marketing process comes into play, which serves to integrate contact personnel into the process [6].

v. A back-office process

The back-office is glaringly absent from the servuction model. But, as Bancel and Jougoux [25] have pointed out, it plays a crucial role in the performance of the service in production. The design of the back-office, on which the delivery of the service depends and which has rarely been studied in the literature, is therefore of fundamental importance. This involves the information systems required (for contract management, invoicing, risk analysis, etc.) and the deployment of internal services and/or partners responsible for producing the service in support of the front-office. When the information and communication technologies are involved, through the deployment of a telecommunications infrastructure, for instance, the task of the designers is considerably complicated.

vi. An economic model for the financing of the service.

The question of the economic model for financing the service appears to be the second element that is glaringly absent from the servuction model, even though it is obviously a central question. It is included, however, in the innovation models. Scheuing and Johnson use the term "business analysis" to describe this task which involves estimating the costs related to the development of the service, the market potential and the revenue sources. We consider this to be an especially important point

⁵ Lovelock [21] has rightly pointed out that a tool such as the "blueprints" proposed by Shostack must also be able to describe "*the service encounter from the customer's perspective*" (p. 61). As a result, there are two "blueprints", and not one, for the same service.

since the innovation may originate with the method of financing the service (it could be free when financing is provided by third parties, for example).

vii. The relationships between the variables

These six variables serve to represent the design work that must be accomplished by the team in charge of the development of a new service. It goes without saying that they are interdependent. The process of designing a service involves working on these various dimensions simultaneously (some of which may be given at the start of the project), otherwise important aspects of the service may be neglected. Furthermore, this simultaneity is made necessary by the co-determination of the different variables. The choices made in one field will, in fact, influence the decisions on the other variables (the choice of a type of interaction with the customer, for instance, will determine the back-office tools required and vice-versa).

Thus the team's ability to integrate these various dimensions will not only determine the smooth functioning of the design process, but also the quality of the final service. The work of Zeithaml et al. [32] clearly shows that the quality perceived by the customer depends on the consistency of the choices made on the different design variables (understanding of usages, the quality of the support product, the suitability of the contract, the performance of the front and back-office process and the economic model).

APPLICATIONS OF THE MODEL

We now have a model representing the service design process. In this last section, we intend to show how this model can be applied for the management of the service innovation process. We have thus distinguished four potential uses for the model.

Characterizing the innovation

Enriching existing typologies

First of all, this model of the service design process can be used to characterize the type of innovation with which the company is confronted. The model thus shows that the innovation can originate with the concept, from one or several design variables or in all probability, from both dimensions at the same time. As a result, it offers a rather detailed characterization of the new features of a service.

Let's consider the example of the emergency call service developed by Telcar. The concept consists, as its name implies, in offering customers a service that allows them to call a number that triggers assistance or an emergency breakdown service in the event of an accident or breakdown⁶. The call makes it possible to determine the exact location of the vehicle. At first glance, the service may seem to be an extension of the assistance services offered for some time by automobile manufacturers. However, when the service is broken down into the six design variables, it becomes clear that there is a clear break concerning several dimensions simultaneously. In fact, the project requires:

1. The development of a support product to provide communication with the vehicle and determine its location, even in the event of an accident;
2. The resolution of the legal problems inherent in providing an emergency service (who is responsible if there is a problem in the assistance chain?)

⁶ Assistance is triggered automatically in the event of an accident.

3. The setting up of the front-office with the understanding that the entity offering the service (the dealership network) is not the same as the entity responsible for its operation (a partner company specializing in emergency assistance).
 4. The design and implementation of a complex back-office system composed of:
 - A telecommunications infrastructure that can locate the vehicle in extremely short time periods and with a high reliability rate;
 - Information systems capable of recording service contracts, managing invoices, and then processing the data internally to manage the customer relationship.
 5. The development of an economic model for the financing of a service that is acknowledged by all concerned to be “difficult to market”⁷.
- The proposed model defines precisely in what ways the proposed service is innovative. In that regard, it is complementary to existing typologies⁸.

Identifying design situations

Continuing with our reasoning, the design variables that we have identified also allow us to distinguish between the various situations that can occur in service design. For this purpose, we will refer to the complex constituted by the back and front-office as the “service infrastructure”, and we will also take the “support product” variable into account. At the start of the project, each of these elements may either already exist or need to be developed. This gives us a typology of the four possible configurations that may be encountered in the design of new services.

<i>Support product → ↓ Service Infrastructure</i>	<i>Existing</i>	<i>New</i>
<i>Existing</i>	A: The ideal situation, little new investment required, marketing of existing installations	B: Development/adaptation of the support product
<i>New</i>	C: Deployment in a new country or process innovation	D: The most complex situation.

- *Case A*: the “ideal” situation in which the existing equipment and infrastructure (adapted where needed) act as supports for the new service. The investment required will therefore be limited. This situation most likely corresponds to a strategy of gradual enrichment of a range of services by the addition of new features.
- *Case B*: this time the new service relies on the existing infrastructure but requires the development of a new support product. Thus the importance of product/service coordination.

⁷ The reader has undoubtedly noticed that the “customer” design variable is missing. On this point, in fact, the service is not very innovative; like the existing services, it is addressed to all Telcar customers provided that they have the onboard equipment.

⁸ The typology proposed by Gallouj and Weinstein [33], for instance, does not include legal and economic questions, just as our model makes it possible to break down their notion of “internal technical characteristics” into several components (support product / front-office / back-office), which facilitates its exploitation.

- *Case C* is particularly interesting because it corresponds to two types of situations frequently encountered in service design:
 1. The deployment of the service in a new country, where one cannot rely on the initial infrastructure (the initial suppliers do not operate in the country, there are different information systems, etc.)
 2. Process innovation with the objective of streamlining the operation of the infrastructure without modifying the service, either to improve its operation or to reduce costs.
- Finally, *Case D* corresponds either to the situation where the launch of a new service requires both the development of new equipment and the implementation of a new infrastructure, or to the situation where the existing service is redeployed using new equipment and a new infrastructure. This is obviously the most complex situation to manage.

This typology allows us to identify various design situations and evaluate the difficulty of the work required of the project team.

Providing a structure for the exploration of fields of innovation

In addition to facilitating the characterization of innovation, the model makes it possible for us to structure the thought process on the future services in two ways.

First of all, it shows that the exploration must combine ongoing reflection on the relevance of the concepts with consideration of the means of acquiring the necessary knowledge. Each new service concept implies the development of areas of competence in the six defined fields while, in return, the development of new knowledge bases facilitates the exploration of the concepts. Any approach failing to combine these two dimensions would be overly simplistic.

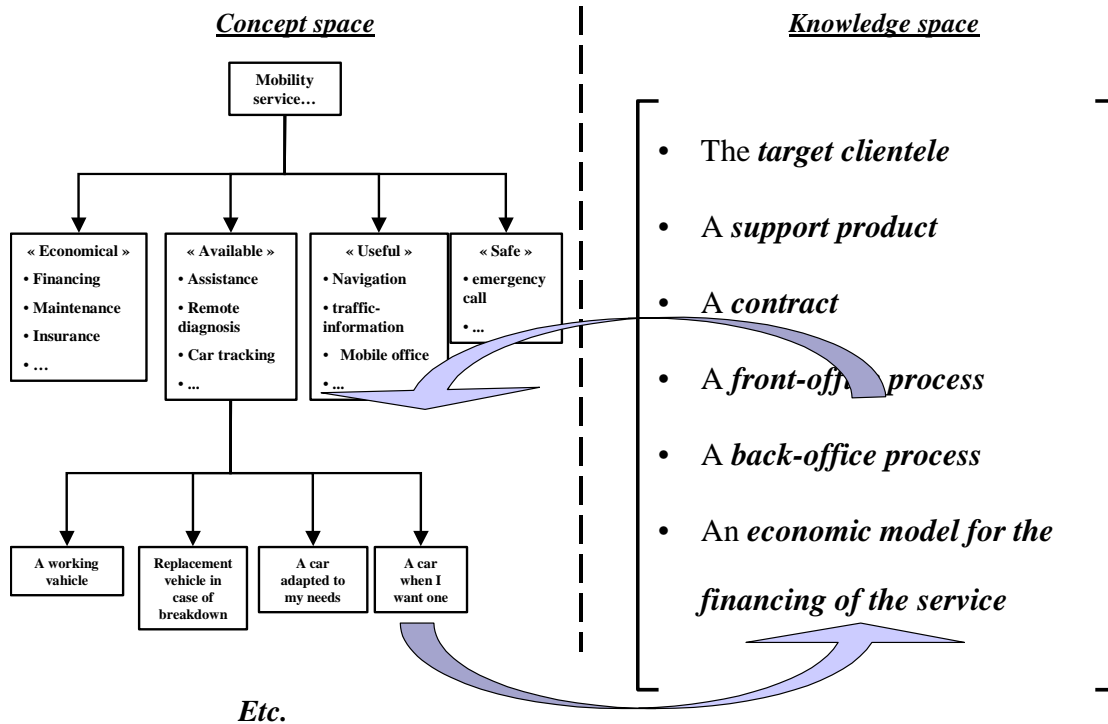
On this basis, the model provides a structure for the reflection process on future services. Let's take the example of telematics services in the automotive sector. We now have a framework that allows us to characterize the avenues for development opened up by the introduction of telematics. We will use the development tree concept for this purpose ([30] and the left side of figure 2), which allows us to represent the various possible options when confronted with a question or design problem. We have used it both for the search for innovative concepts and for the previously identified design variables. We will now show how this model can facilitate the management of the innovation process.

The conceptual dimension

What are the concepts that will guide the development of the future services? The use of ICTs has led to an explosion in the number of potential new services. Just about everything becomes conceivable, from the improvement of existing services (location-based roadside assistance, for instance) to ground-breaking innovations (mobile offices, remote navigation, real-time traffic-information, etc.). The difficulty is then in organizing this profusion of potential new services and in giving it meaning.

The concept (in the meaning of C-K theory) that we consider to be central is the “mobility service” concept. But expressed in this way, it is still rather vague. It is therefore necessary to continue the reflection process and break it down into sub-concepts that represent potential areas for exploration. This leads to the following design tree (see the left side of figure 2). Each branch of the tree is aimed at offering the customer a certain kind of value: optimization of the customer's automobile budget

in the first case, and of transportation time in the third case⁹, and so on. But it is still possible to refine the concept and continue the construction of the tree.



Let's consider the "available mobility service" branch, for example, which constitutes a concept within the meaning of C-K theory. It can be "divided up" even further. The "available mobility service" concept is not, in fact, defined *ex ante*. It opens up a wide field of possibilities. The translations of this concept in terms of services can therefore be quite varied. The first two cases refer to traditional solutions already implemented by Telcar (i.e. maintenance and assistance). The two branches on the right, however, constitute entirely new services:

- "A car adapted to my needs", which allows customers to change cars depending on their objective: a compact vehicle during the week and a minivan when on holiday.¹⁰
- "A car when I want one" is based on the idea of offering customers the car of their choice, wherever and whenever they so choose.

This demonstrates the interest of the development tree concept for representing potential areas for exploration and for developing new services. It should be noted that the various branches are not mutually exclusive.

The knowledge dimension

Innovation is not limited to concepts. One must, in fact, determine simultaneously whether or not these potential areas for exploration are likely to be fruitful, which takes us back to the dimension of available knowledge or knowledge

⁹ By reducing it, through the use of navigational and traffic information systems, for example, or by making the best use of it (through mobile office type solutions or games for passengers, etc.).

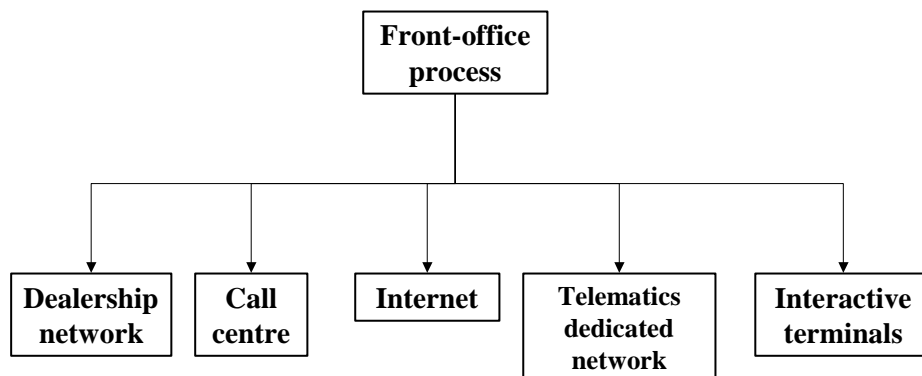
¹⁰ This idea was part of the SMART project as it was originally conceived by N. Hayek.

that must be acquired if we are to assess the relative fruitfulness of one of these areas of exploration¹¹. An exploration method based on the C-K theory thus allows us to establish a link between the desired target (the concept) and the learning process that it implies (the knowledge bases). The relevance of a concept will therefore be evaluated not only for its intrinsic originality but also for the learning process on which it depends (complex or simple, limited to one variable or highly multidisciplinary, protracted or brief, etc.). But the link is not unilateral, and the development of new knowledge (the new information and communication technologies, for example) can give rise to new concepts.

To illustrate our remarks, let's return to the example of automotive services and consider the front-office process. Thus far, the preferred point of interaction with the customer has been the dealership network. But there too, one can conceive of other solutions that would offer more flexibility (Figure 3). The establishment of a direct relationship between the customer and the brand, via the Internet or a call centre, has already been implemented by Telcar. This type of interaction should become increasingly important in the context of Telcar's CRM strategy and in light of current automobile distribution trends in Europe.

But one could also conceive of more innovative solutions: the implementation of a sales network dedicated to the marketing of services, for instance, or the deployment of interactive terminals (in service stations, for example) capable of uploading data, updating software, and so on¹². This is a crucial venture for Telcar and a real challenge since this type of customer relationship is completely new.

Figure 3: potential areas for Front-Office innovation.



The same can thus be seen

developed

tree

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decisions made, it reminds us that the path on which the project is engaged (interaction via a call centre, for instance) is only one solution among all

¹¹ Does the concept of "a car adapted to my needs" appeal to customers? How much are they willing to pay? How do we know this? Is it profitable? etc.

¹² This last solution is already used by Toyota in Japan.

¹³ The model can then serve as a knowledge management tool : what have we learned about the back-office? about the reactions of various types of customers? about the front-office? etc.

the other possible options (the Internet, a dedicated network, etc.). Moving further up the tree can thus open up new potential areas for innovation, with regard to both concepts and knowledge bases.

Analyzing and managing the innovation process

Finally, the model presented can serve as a support for the construction of management tools for the new services development process. The preceding model already constitutes a management tool for the exploration of the field of innovation. But the model also has other potential uses.

First of all, it is useful for specifying the content of the various stages of the process. Let's take the example of the "concept development" stage that is found in all service innovation models. In their 1989 article, Scheuing and Johnson defined the concept as "*a description of a potential new service. A typical concept statement would include a description of a problem that a prospect might experience, the reasons why the new service is to be offered, an outline of its features and benefits, and the rationale behind its purchase*" (p. 31). Our model allows us to specify the content of the stage which, ideally, should not only make it possible to clarify the concept, but also to explore its impact on the various design variables. The goal of this upstream stage is therefore to map the possible solutions for implementing the concept without making a definite decision between the various options at this stage in the process.

This reasoning can then be extended to the entire process. The design of a new product or service is typically a process of knowledge creation [34]. In this perspective, our model supplies a diagram of the various fields of knowledge that need to be acquired during the process. The various stages must contribute gradually to:

- Clarifying the concept
- Developing the required knowledge, which will require that studies be performed, that prototypes and testing be carried out under conditions that will little by little approach those of the "final" servuction system.

On this basis, a process management tool can be designed that cross-references the stages on the one hand, with the concept and knowledge bases on the other hand. A management chart of this type can then assist the designers with the task of overseeing the project:

- What stage are we at concerning the various dimensions of the service (theoretical studies, internal testing, customer testing using a prototype or testing on the future servuction system, etc.)?
- Are we sure that we have not neglected a dimension that may cause a problem later on?
- Have we involved participants with the necessary skills? The drafting of the contract, for instance, would require the participation of legal specialists, and the development of the front-office system would require the participation of the Sales Department and contact personnel, etc.
- Etc.

We can then back up traditional project management tools with the support of an ad hoc service design model.

CONCLUSION

In view of the fact that service design has become a central question in the current economic context, this article has attempted to show both the contributions of the literature and the interest of recent developments in design theory. The work of

Hatchuel and Weil, by distinguishing the conceptual dimension from the knowledge dimension, offers us a framework for a comprehensive view of the design process for both products and services. In the latter case, the literature on services and our research at Telcar have led us to identify the various design variables for a service. We then demonstrated how this model could be used to provide a structure for the exploration and generation of new concepts, and to manage the design process.

These proposals must now be further clarified. The application of this model to another example and/or in another context would allow its relevance and reliability to be tested. Another potential application, currently being explored with Telcar, involves using the model to develop management tools, the rationale for which we have briefly touched upon. This brings up the central question of the need to clarify the means of acquiring knowledge about the various service design variables.

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